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Forest Health Protection

Pacific Southwest Region



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To: District Ranger, Sierraville Ranger District, Tahoe National Forest
(Report # NE01 – 5)

Subject: Rice Canyon Creek SMZ Restoration Project Monitoring Report

Summary

The Rice Canyon Creek SMZ restoration project was implemented in 1997 in response to high bark beetle-related mortality in Jeffrey and lodgepole pine. The high levels of mortality were attributed to overstocked stand conditions and the protracted drought period that occurred from 1987 through 1994 (see FPM Report #NE95-12). Thinning of the project area occurred in 1998, effectively reducing the Stand Density Index (SDI) from 548 to 275.

Bark beetle activity and related tree mortality declined sharply within the project area as well as throughout the entire eastside following the return to normal or above normal precipitation levels during the 1994/1995 winter. Future monitoring during periods of below normal precipitation will allow for full assessment of the efficacy of this bark beetle prevention/suppression thinning project.

Background Information

This project was initiated to improve forest health in designated areas within the perennial Streamside Management Zone (SMZ) of Rice Canyon Creek. These areas, consisting of bark

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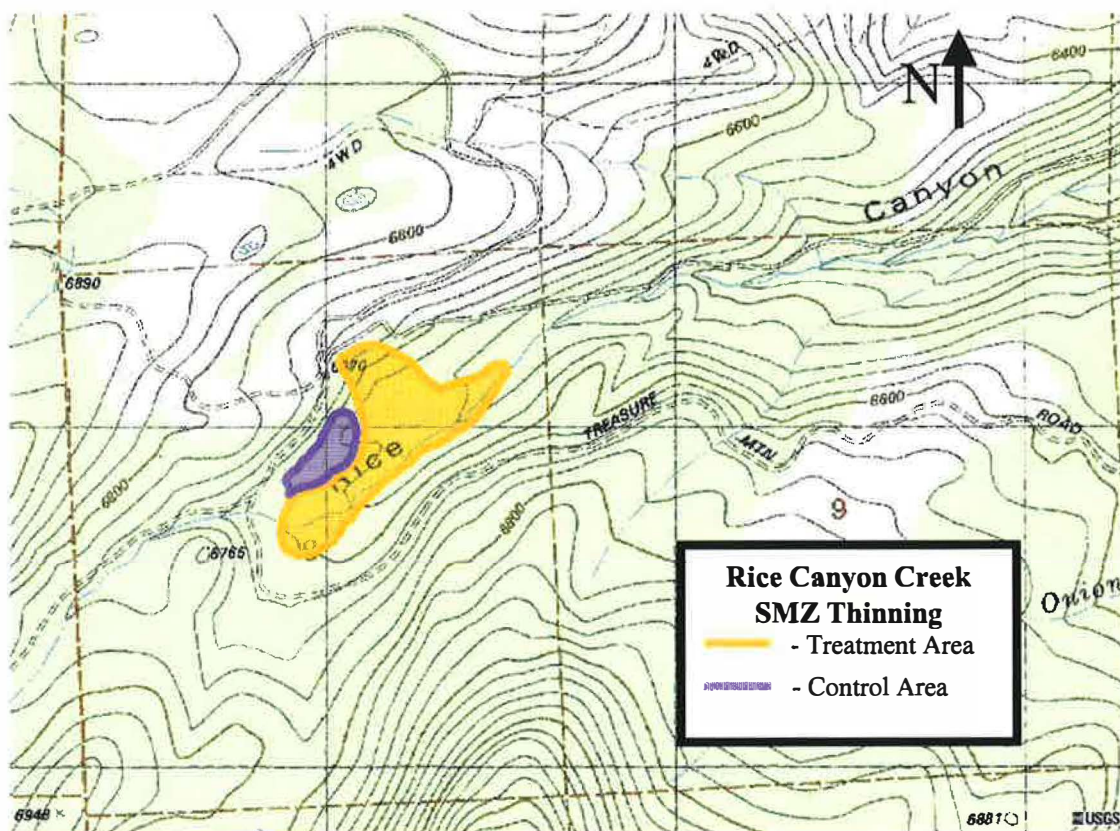
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beetle infested and severely overstocked stands, were treated using silviculturally prescribed methods to reduce overall stand densities.

Rice Canyon Creek is located on the eastside of the Sierra Nevada Mountains on the Sierraville Ranger District, Tahoe National Forest (Figure 1). The area is located in the 40" isohyetal precipitation zone at an elevation range between 6,400 to 6,800 feet. Forest stands within the SMZ consist of Jeffrey pine, lodgepole pine, white fir, and aspen. Riparian vegetation includes scattered patches of willow in the open meadows.

Typically, little or no management occurs within perennial SMZ's. Past SMZ planning has not addressed forest health restoration through thinning as the impacts associated with cutting trees in these zones have been viewed as unacceptable. These zones are usually reserved as protective buffer strips for the riparian/aquatic ecosystem.

Figure 1. Map of project area. (T19N R15E S8)



Many eastside forest stands within riparian zones exhibit unhealthy, overstocked stand conditions. Eastside forest types have experienced dramatic changes in stand structure and vegetation type over the past 100 to 150 years as a result of fire exclusion, logging and livestock grazing. The resulting stands are more densely stocked with smaller diameter trees and have heavy fuel loads (Laudenslayer et al. 1989, Taylor 1998). Stands exhibiting these conditions,

including stands within riparian zones, are very susceptible to bark beetle attack and stand replacing wildfires. Impacts associated with these events when they occur in streamside habitat can include loss of cover, an increase in soil and water temperatures, an increase in down, woody material, altered stream flows, and a shift in species composition and in the distribution of vegetation and wildlife.

The Rice Canyon Creek suppression/prevention project proposal was submitted to Forest Health Protection (FHP) for FY97 funding. Resource managers cited the overstocked conditions and the high level of bark beetle-related conifer mortality as primary concerns within the SMZ. Stands within the Rice Canyon Creek SMZ were identified in the Treasure Analysis Area as being at high risk to stand replacing wildfire due to the high accumulations of down and standing fuels and as being very susceptible to increased levels of bark beetle-related tree mortality due to high stand densities.

Trees in the area were subsequently marked for removal in 1997 and were mechanically harvested in 1998. Marked trees in the project areas included all trees that were currently green infested, recent insect killed trees, and some older insect killed trees as well as some green, non-infested, trees. The total number of trees marked and mechanically removed is summarized in Table 1.

Table 1. Total Trees Marked and Removed

	JP	WF	LP	Total
>10" dbh	641	460	380	1481
<10" dbh	574	641	660	1875
TOTAL	1215	1101	1040	3356

Jeffrey pine is the predominant tree species in the project area followed by lodgepole pine and white fir. Pre-project plot data revealed a Stand Density Index (SDI) of 548. An SDI of 548 is well above the SDI 365 determined by Oliver and Uzoh (1997) to be the level at which pine stands can suffer large losses from bark beetle epidemics. The goal of the thinning was to reduce the SDI to <230 while maintaining >40% canopy closure. SDI 230 defines a threshold for a zone of imminent bark beetle mortality in ponderosa and Jeffrey pine stands within which bark beetles kill a few trees but net growth is still positive.

Complete and prompt removal of all infested trees was also an important objective for reducing future Jeffrey and lodgepole pine mortality. Based on data obtained from other direct suppression projects, (mountain pine beetle in lodgepole pine at Donner Camp, Tahoe NF, and Jeffrey pine beetle at Pole Springs, Lassen NF and in Manzanita Lake CG, LVNP) tree mortality can be greatly reduced in subsequent seasons by removing green infested trees prior to beetle emergence.

Clumps of healthy trees and adequate numbers of snags were retained to meet wildlife habitat objectives.

Bark Beetles

The Jeffrey pine beetle (*Dendroctonus jeffreyi*) breeds exclusively in Jeffrey pine. Trees attacked by the beetle are typically slow growing and exhibit reduced vigor. These are usually large over-mature trees that occur singly or younger suppressed trees growing in dense stands (Smith 1971). Trees with dwarf mistletoe (*Arceuthobium campylopodum*), fire injuries, mechanical injuries, root disease or those stressed by other agents can also be at risk. When high levels of tree mortality occur, generally during periods of below normal precipitation and in overstocked stands, the beetles can attack and kill any tree regardless of size, age and/or vigor (FHP data from Lost Creek in LVNP). The infested trees during outbreaks are usually found in various sized groups. Promoting health and vigor of stands by reducing competition from overstocking, through mechanical thinning and/or prescribed fire, is the only management alternative for reducing/preventing bark beetle outbreaks in the general forest area.

The mountain pine beetle (*Dendroctonus ponderosae*) generally attacks lodgepole pine stands that are at high-risk. High-risk stands have an average age of 80+ years and an average DBH of 8" or more. Beetles usually select larger lodgepole pines. After larger lodgepole pines are killed the beetles select smaller trees until food resources are depleted and populations decline. A copious pitch flow from the pines can prevent successful attack. The number of beetles, the characteristics of the tree, and the weather affect the tree's ability to produce enough resin to resist attack. As stand susceptibility to the beetle increases because of age, overstocking, diseases or drought, the effectiveness of natural control decreases and tree mortality increases (Amman et al. 1989).

Monitoring

A monitoring plan was implemented in March 1997 to evaluate the thinning treatments for effectiveness in reducing future levels of conifer mortality. Monitoring consisted of the pre-treatment documentation of all bark beetle killed trees marked for removal. An untreated control area was also established, with all bark beetle activity documented, for comparing the effects of thinning versus no treatment of stands on bark beetle activity and related tree mortality. Annual visits were planned in both the treatment and control areas to document changes in stand conditions and any short- and long-term bark beetle activity and tree mortality.

Results

In 1997 District and FHP personnel marked trees in the treatment areas and recorded numbers of infested trees. Pre-harvest data of bark beetle activity and tree mortality for the treatment and control areas are summarized in Tables 2 and 3.

Table 2. Total Bark Beetle Infested Trees Marked

	JP	WF	LP	Total
Older Dead	83	25	166	274
Recent Dead	78	3	71	152
Currently Infested	115	0	63	164

Table 3. Total Bark Beetle Infested Trees for Control Area

	JP	WF	LP	Total
Older Dead	0	14	21	21
Recent Dead	0	0	9	9
Currently Infested	3	0	8	11

In September 2000 and again in July 2001 Forest Health Protection personnel inspected all trees within the treatment units as well as the control for any bark beetle activity. These results are summarized in Tables 4 and 5. The post-harvest Stand Density Index was determined to be 275.

Table 4. Treatment Area

	JP	WF	LP	Total
Recent Dead	1	0	5	6
Currently Attacked	2	0	3	5

Table 5. Control Area

	JP	WF	LP	Total
Recent Dead	0	0	0	0
Currently Attacked	0	0	0	0

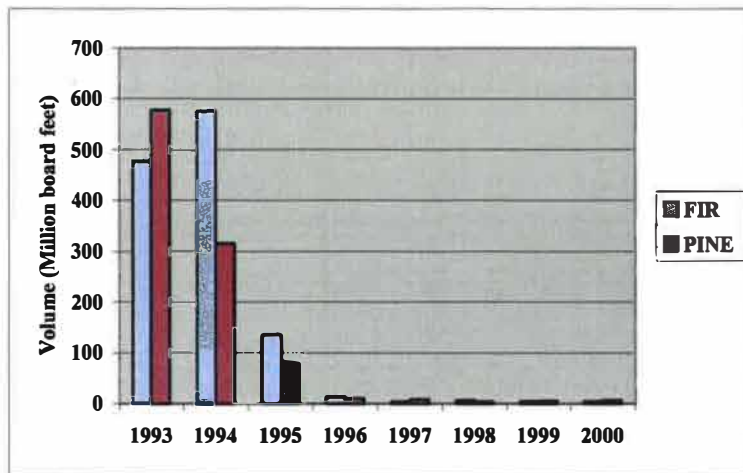
Discussion

Thinning of the project area which included the removal of green infested and older dead trees reduced the Stand Density Index from 548 to 275. Although this is above the stated goal of SDI <230 it is well below the SDI 365 where bark beetle attacks can result in high levels of pine mortality. We observed two attacked Jeffrey pines and 3 attacked lodgepole pines (located on the perimeters of since removed pockets of bark beetle killed trees) in the fall of 2000 and in the summer of this year (to date, these trees have not faded). This number is greatly reduced from the 115 infested Jeffrey pine and the 63 infested lodgepole pine that were identified pre-treatment. The smaller control area had no currently infested trees (in general, the control area has a lesser component of Jeffrey pine and a higher component of white fir compared to the treatment area). Fir engraver beetle (*Scolytus ventralis*) activity and associated mortality seems to have declined before project implementation. Drawing conclusions based on the current number of infested trees in both the treatment and control areas is difficult based on the recent period of above normal precipitation throughout the eastside. The general trend for levels of conifer mortality over the last 6 years has been a reduction throughout the Sierra Nevada (Figure 2).

Since 1994 we have observed a dramatic decline in tree mortality compared with that observed during the recent protracted drought period (1987-1994). However, stand conditions in many places still favor high levels of bark beetle and drought-related tree

mortality. Assessing the effects of prevention/suppression thinning projects on reducing bark beetle-related conifer mortality will only be possible when stands are stressed by periods of below normal precipitation. FHP personnel plan on continuing the monitoring of the Rice Canyon Creek SMZ to evaluate long-term effects of this management alternative.

Figure 2. Mortality from bark beetles on National Forest Lands in the Southern Cascades and the Sierra Nevada



Recommendations

If management goals and objectives continue to include the desire to limit bark beetle-related conifer mortality within and adjacent to the Rice Creek SMZ, management activities should focus on maintaining tree densities that are below SDI 230. Any management alternative, whether it is prescribed fire or thinning, should be conducted when conditions are favorable (normal or above normal precipitation) and trees are not being stressed by drought and bark beetle attacks. Increased health and vigor of remaining trees is often not realized until several years post treatment. Waiting until bark beetle activity is increasing is often too late to alter the cycle of events.

We noted some bark beetle attacks on trees that were in the immediate vicinity of burn piles. Mountain pine beetles are very attracted to wounded trees and sufficient distance should be maintained between burn piles and residual trees to ensure that tree injuries do not occur.

Future management activities in the Rice Creek SMZ should also focus on favoring aspen over conifers where they occur together as well as expanding existing aspen stands by conifer removal. Aspen stands provide excellent wildlife habitat and canopy cover while extracting less water from the soil than conifers. Conifers may use 3-7 times as much water as aspen due to transpiration during spring and fall when aspen are not transpiring. As a result aspen stands have more water available for undergrowth production and stream flow (Bartos and Campbell 1998, DeByle and Winokur 1985).

Please contact the Forest Health Protection entomology staff if you have any questions regarding this report.

A handwritten signature in black ink, appearing to read "Danny Cluck". The script is fluid and cursive.

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Biologist

A handwritten signature in black ink, appearing to read "Sheri Lee Smith". The script is fluid and cursive.

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